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The Problems of Bovine Mastitis*

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J. FRANCIS.—An understanding of mastitis is particularly difficult because the physiology, histology and pathology of the udder are so complex. The udder tissue and hence the histology of a "normal udder" undergoes continuous change which is related to changes in the reproductive organs. It is important to remember that when a cow goes dry for any length of time nearly all the glandular tissue degenerates and is replaced by new secretory tissue in the next lactation. In the high-producing cow the picture is complicated by the fact that simultaneously with these degenerative changes, regenerative changes in preparation for the next lactation are already occurring. It is no wonder that things sometimes go wrong. It is not proposed to deal with the little understood subject of formation and secretion of milk into the alveoli of the udder but it is relevant to note here that for a cow to produce five gallons of milk, ten tons of blood must pass through the udder.

It is well recognised that methods of husbandry and milking have an important effect on the incidence of mastitis; in order that milking methods can be placed on a sound basis we must understand the physiology of milking.

THE PHYSIOLOGY OF MILKING.—Examination of amputated udders has shown that all the milk obtained at any one time is present in the udder before milking commences. The udder is supplied with efferent (motor) sympathetic nerve fibres which maintain tone in the blood vessel walls, but these nerves have no secretory function, and it is now accepted that there are no secretory nerves to the udder.

When milking begins, sensory stimuli from the udder and teats cause the pituitary to secret oxytocin. This causes contraction of the smooth muscle around the alveoli and small ducts which contain most of the milk and, as a result, the cow "lets down" her milk. Pain, fear or excitement tend to prevent this nervous-hormonal reflex, and then it is said that the cow is "holding up" her milk, but this is a misleading term. The holding up of milk is not an active process; apart from the small amount in the teat and gland cistern, milk cannot be obtained from the udder except when pituitrin causes contraction of the plain muscle fibres. It is usually some fault in management which inhibits the release of pituitrin; the vigorous protests which some cowmen indulge in only make matters worse.

When once the cow has been stimulated to secrete pituitrin all the milk obtainable, about 80-85 per cent. of that in the udder, must be removed as rapidly as possible because pituitrin is fairly rapidly destroyed in the blood, and so the smooth muscle round the alveoli soon relaxes again. Petersen (1944) states that machine milking should never take longer than four minutes. As one would expect, stimuli which the cow associates with milking will cause the release of pituitrin. Petersen has found that the most efficient method of machine milking is to give the udder a preliminary wash with warm water about one minute before milking, since this causes the "let down" of milk. Without this preparatory stimulus the machine may rapidly empty the teat and cistern before the cow lets down her milk; the teat cups are then liable to crawl up the teats and compress the ducts and delicate tissues at the base of the udder: as a result inflammation is likely to occur, particularly in the small accessory secretory glands which are found in the upper part of the teat sinus. In the same way, when the teat cups begin to crawl up the base of the quarters at the end of milking they should be pulled down, and if this is done Petersen claims that stripping is unnecessary and that with well-trained cows all the milk can be obtained in 3½-4 minutes. He also suggests that if cows are trained to this short milking period as soon as they come into the milking shed after calving, a higher yield will be obtained.

Another aspect of milking which has an important relationship to mastitis is the method of "drying-off" cows. Steyn (1940) maintains that the best way to "dry-off" cows is by the complete cessation of milking, but the food intake must be reduced. There is no doubt that with the method of intermittent milking, secretion is re-stimulated every time the cow is milked, and we are all familiar with the blind quarter which if unopened "dries off" quite satisfactorily even at the beginning of lactation when milk secretion is at its height. It seems that the various methods of "drying-off" cows should be studied as they have an important effect on the maintenance of a healthy udder.

Unfortunately we know very little about the pathology of mastitis but we have some understanding of how changes in the milk occur. It appears that the cells of the diseased udder tend to lose their selective powers and become more permeable to normal constituents of the blood. That is, the catalase and chloride content, and the alkalinity of milk from the diseased udder all increase; the synthesis of lactose is reduced. Much the same changes occur during the "drying-off" period (Garrison and Turner, 1936). It will, of course, be realised that it is this increase of catalase and chloride in the blood and the increase in alkalinity which are used in the various indirect tests for mastitis.

INCIDENCE OF DISEASE.—The incidence of mastitis and the consequent loss of milk has been variously estimated but all agree that the losses are large and it appears to be generally accepted that the incidence of the disease has greatly increased during the present century. Indeed we hear, quite rightly, so much about the importance of controlling disease to-day that there seems to be a general belief in the profession and amongst farmers that disease of all sorts is more prevalent and causes more loss than it did in our fathers' and grandfathers' day. One only has to think for a moment to realise that this belief is incorrect; if it were correct it would be a grave reflection on the profession and on the farmers of Great Britain. One can make this statement on general grounds because of the advances in bacteriology which have led to the control of the major epidemic diseases, but, in my opinion, there is evidence concerning the incidence of mastitis.

Youatt (1870) says: "Cows are very subject to inflammation of the udder soon after calving. . . . . This in some cases shows itself in the form of excoriations or sores, or small cracks or chaps on the teats, and very troublesome they are. The discharge likewise from these cracks mingles with the milk." When one realises that foot-and-mouth disease was endemic at this time and cows were kept under conditions far worse than anything that occurs to-day, there can be no doubt that mastitis was common, but it did not attract as much attention as it does now because there were more important diseases—diseases which killed animals. In the same way in the Colonies and India, when veterinary workers first went out to these countries the great epizoötic diseases were rampant and no one noticed mastitis. Now that these more serious diseases are being brought under control and people have time for less important things they are realising that mastitis is a common condition.

In 1888, Bernard Bang said: "It is not necessary for me here to describe at length what *mastitis* means and how it manifests itself." That is something you all know. But if the question is raised whether the disease plays any practical role, the answer will probably be far from unanimous. One farmer, I think, will probably say that he had been lucky enough for a number of years to see not even a single case of this disease, while another will say he has seen it often enough and yet only now and then; but there will also be a few who have had sad experiences with frequent occurrence of this disease and great financial loss on that account. Even when it is relatively spasmodic, it is rather troublesome, for it attacks especially first-rate milkers and in the beginning of the milking period.

You may feel, however, that in the period before the last war when the major diseases had been controlled our cows were healthier than they are to-day. Hugh Begg, writing in Hoare's "System of Veterinary Medicine," says: "For quite a century mastitis has been recognised and written about as a serious disease of milch stock." Considering the filthy conditions under which cows were kept he wondered that mastitis was not more prevalent,

* Papers delivered at a meeting of the Lancashire Veterinary Association at Liverpool on April 28th, 1944.

"But nothing teaches a dairyman so effectively the virtue of cleanliness in the handling of milch cows as an outbreak of acute mastitis. The labour entailed, the loss sustained, and the disorganisation of the herd and the milk-supply, impel him to do all he can to prevent a recurrence of this dread disease."

Aetiology.—There has rightly been much discussion concerning the various causes which increase the susceptibility of the udder tissue to bacterial infection (Francis, 1941). Whilst we recognise that both acute and chronic inflammatory conditions not associated with bacterial intection occur and may even be common in some herds, there is little doubt that the various bacterial invaders are the chief immediate cause of the conditions we know as mastitis. If *Str. agalactiae* were eliminated farmers would be very much less worried by mastitis.

Diagnosis.—Bacteriological methods of diagnosis are not of much interest to practitioners, but it should be clearly realised that various methods of examining milk samples are now employed, and some detect smaller numbers of organisms than others. A negative laboratory report does not necessarily mean that more delicate tests would not reveal the presence of organisms.

The incidence of mastitis is, however, so great that no method of control based on bacteriological diagnosis could be carried out at the present time. A large responsibility therefore rests on practitioners to employ clinical methods of diagnosis. The emphasis which has been laid on bacteriological methods may have discouraged some practitioners from carrying out this work, but Udall and his collaborators in the U.S.A. have carried out very careful physical examinations of cows' udders. Their procedure is explained in Udall's valuable book on "The Practice of Veterinary Medicine." Udders are divided into four main classes.

Number 1 are normal in every respect or may contain very slight indurations. *Number* 2 contain a few slight indurations or a single distinct lesion. *Number* 3 show a fairly extensive fibrosis or lobulation and there may be slight changes in the milk. *Number* 4 show a distinct fibrosis and lobulation; atrophy and asymmetry are common.

The strip cup examination and brom-thymol blue test are also taken into consideration when classifying udders.

Murphy, Udall, Johnson and Tomkins (1944) have reported that of the most nearly normal udders obtainable by laboratory methods 69·4 per cent. average slight and 30·6 per cent. distinct induration. It was therefore concluded that slight and distinct induration are not themselves abnormal. Streptococcal infection was found in 72·8 per cent. of No. 4 udders, 33·2 per cent. of No. 3 udders, 5·2 per cent. of No. 2 udders. Staphylococcal infection was probably responsible for many of the No. 3 udders. Kennedy (1943) examined 65 quarters originally bacteriologically negative, twice daily for 143 days. Bacteriological examinations were carried out weekly. Only seven quarters became permanently infected with *Str. agalactiae* but 20 per cent. of the examinations of these quarters prior to the isolation of *Str. agalactiae* revealed clinical abnormality whereas only 5·5 per cent. of the remaining 58 quarters (some of which showed a transient infection) showed clinical evidence of mastitis during the 143 days.

All this may seem a little inexact, but it must be remembered that the results of bacteriological examination may vary depending on the method used, and it would seem that a practitioner who bases his diagnosis on a careful clinical examination combined with strip cup and brom-thymol tests and who elicits the enthusiasm and support of the farmer and cowmen will achieve better results than the one who relies on bacteriological diagnosis and who does little clinical work. A combination of both methods is of course the ideal.

Control.—Bang (1888) in the paper already mentioned tells how an apparently infectious form of mastritis was controlled in one herd. "On the advice of the veterinary surgeon all the sick cows were placed together at one end of the stable where the drainage was good, and care was taken that these cows were milked last, and that the milkmaids washed their hands thoroughly after milking. In addition, the udder of every cow was cleaned thoroughly and washed with a phenol solution—also the healthy cows. The disease was checked from that time on."

We may use different disinfectants to-day, but there is little one can add to this. The importance of good milking hygiene and the prevention of injury to teats has already been mentioned.

Treatment.—The value of infusion of the udder with acriflavine (1/10,000) or entozon (1/2,500) has now become well recognised. Considering all the evidence, one can perhaps conclude that with one infusion of either acriflavine or entozon, 40-60 per cent. of bacteriological cures will be obtained and with two infusions 60-80 per cent. Tyrothricin or gramicidin, sulphanilamide in oil, and silver oxide in oil have all been used for udder infusion, but as yet there is no really substantial evidence that they are better than acriflavine (*Vet. Rec.*, **55**, 241). Following an extensive trial Stableforth *et al.* (1942) concluded that treatment with sulphanilamide cannot be recommended as a routine method for the elimination of *Str. agalactiae* from the bovine mammary gland, but that it has a definite place in the treatment of the associated clinical symptoms and that for this purpose an initial dose of 10 gm. per 100 lb. body weight followed by half this dose at 12-hourly intervals for a few days is a suitable scheme of dosage.

It has been stated (Johnson, 1941) that any cow showing flecks of pus in the secretion when dry is probably infected with *Str. agalactiae* and should be treated; this seems a very practical suggestion. It is not easy to predict the result of treatment, but here again Udall and his colleagues maintain that as good a prognosis can be made on clinical examination as by bacteriological diagnosis.

Any method of treatment that requires many infusions is obviously impracticable.

Other Forms of Mastitis.—You are all familiar with mastitis caused by *Str. dysgalactiae*, *Str. uberis*, staphylococci and *Corynebacterium pyogenes*. I do not wish to say much about these, but in one respect they are all essentially different from *Str. agalactiae* mastitis. The normal habitat of *Str. agalactiae* is the cow's udder, and it is very seldom isolated from other places except the dirt of byres recently infected. On the other hand, all the other organisms are normal inhabitants of the bovine tonsil and vagina (Francis, 1942), and so it would seem impossible completely to eliminate sporadic outbreaks of mastitis due to these organisms.

An Experimental Approach

The great difficulty in finding new drugs for the treatment of mastitis is the amount of work entailed and the variability of the results obtained when treating the natural disease. Although drugs must finally be assessed in the cow, a simpler method of approach is required for testing speculative compounds. *In vitro* tests can obviously yield some information, but they are not altogether satisfactory. We have, therefore, attempted to infect chick embryos with *Str. agalactiae* and have met with some success. It appears that different strains do not all have the same virulence for the chick embryo: a suitable strain can be passaged directly from egg to egg. When infection is established all organs of the chick are infected as well as the chorio-allantoic membrane. *C. pyogenes* has also been carried through a number of passages in the chick embryo. It has been shown that sulphamezathine exerts much the same therapeutic effect against *Str. agalactiae* when inoculated into the yolk sac as when applied locally on the chorio-allantois. On the other hand, proflavine is effective when applied locally, but so far no therapeutic effect has been demonstrated when this drug is inoculated into the yolk sac. It thus appears that the chick embryo will provide a useful means of searching for new drugs exerting a local or systemic action against *Str. agalactiae*.

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J. S. Steward: The aspects of the subject which I propose to discuss are largely from the viewpoint of public health, diagnosis, and control, other than by chemotherapy. The statutory position of the disease under the Food and Drugs Act, 1938, Sect. 25 is such that—"(1) No person shall (*a*) sell, or offer or expose for sale, for human consumption; or (*b*) use in the manufacture of products for sale for human consumption the milk of any cow which to his knowledge has given tuberculous milk, or is suffering from emaciation due to tuberculosis, or from tuberculosis of the udder or any other disease of cows to which this section applies." (The defendant is deemed to have known if he could with ordinary care have ascertained the fact.)

The diseases of cows to which Sect. 25 applies are:—Acute mastitis, suppuration of the udder, any infection of the udder or teats which is likely to convey disease, any comatose condition, any septic condition of the uterus, actinomycosis of the udder, anthrax, foot-and-mouth disease. It will be seen that it is permissible to *use* for human consumption such milk as is affected by Sect. 25, though not to *sell* it. Thus, individuals or bodies corporate who produce milk may use such milk for their staff, themselves or school children and one may legally give such milk which may be unfit for human consumption to the inmates of schools, homes and hospitals. The milk from cows affected with other than acute forms of mastitis does not come within the scope of these regulations unless especially brought in under the definitions "Suppuration of the Udder" or "Infection of the Udder or Teats likely to convey disease." Furthermore, *if brought under the scope of the Act* by this ruse the milk from the whole of the udder of a cow affected with chronic or sub-acute mastitis of one quarter only would be subjected to restrictions. As the Ministry of Agriculture official publication (Memo CS2) states that from 80-90 per cent. of cases are due to *Streptococcus agalactiae* and that this mastitis is only occasionally acute, it follows that most cases of mastitis do not *directly* come within the scope of the legislature.

As is well known to the veterinary profession, one quarter only is usually affected and special provision requires also to be made for this fact. The position in the graded herds (Accredited and Tuberculin tested) is little better though the regulations affecting such herds are supplementary or additional to the Food and Drugs Act quoted above. In fact in this connection the Milk (Special Designations) Order, 1936, only requires that "where an animal is certified as showing evidence of any disease which is likely to affect the milk injuriously it shall be segregated from the rest of the herd or removed from the herd as the case may require *and the special designation shall not be used in relation to its milk*!" (My italics and exclamation mark—J.S.S.). Thus it would appear that this milk may be *sold* as ordinary milk unless the cow comes within the scope of the Food and Drugs Act as above, or *used* in any case whether she does or not!

That is the problem of mastitis for the Ministry of Health, and it might be solved with the advice of those experienced in the highest standards of veterinary public health work, by amended legislation to take care of the everyday practical requirements for the protection of the public health. It may possibly be useful to define mastitis for such (Public Health) purposes and a suggested definition is as follows:—

> "Mastitis may be defined as an anatomical or functional abnormality (inflammation) of one or more quarters of the udder due to present or past infection, marked by abnormality of the milk (macroscopic or microscopic) and accompanied usually by one or more of the customary attributes of inflammation, most frequently induration or enlargement."

As you will be aware, the State Veterinary Service was inaugurated under the Agriculture Act, 1937, on April 1st, 1938, and from that date there was partition of the administrative duties under the Milk and Dairies legislation. This has rendered the enactments almost unworkable, as enforcement of compliance is undertaken by the Local Authority (County and County Borough Councils) and not the examining authority (Ministry of Agriculture's veterinary officers).

Experience in the routine examination of cows for a number of years suggests that in the incidence of the disease several factors work in conjunction, such as age, exposure to infection and patency of the teat, both the latter being usually increased *pari passu* with age*. Injury either by natural traumatism or faulty milking machine was also important.

Diagnosis.—Clinical recognition depended most frequently on the presence of induration or enlargement together with milk abnormality and often thickening of the teat duct. The presence of any thickening of the teat palpable by rotating the teat between finger and thumb indicated present or past infection of the udder and was a most important diagnostic sign. It was absent in tuberculosis of the udder unless there was secondary infection, past or present.

Records.—It was very important to keep good records both for the benefit of experience and the value of the records in the history of either the cow or the herd. It was possible for these to be very brief but comprehensive, and it was useful to record the findings in order of significance; thus if induration was more marked than enlargement that would be the order of recording. They should be kept under three headings. (1) *Clinical Findings* (Induration—local or general, enlargement, thickening of teat duct, pain, heat, redness, enlargement of supramammary lymph nodes, etc.), (2) *Appearance of the Milk* (macroscopic) and (3) *Cytology of the Milk* and microscopic findings.

(2) Milk.

(*a*) *Cream.*—When milk was centrifuged in the usual tube of approx. 15 c.c. capacity there was normally about ¼ in. cream, at a minimum. Reduction of cream generally indicated mastitis, but was not present as a rule early in the disease though the consistency might then be altered to a "pussey" or slimy nature.

In tuberculosis of the udder the cream was not usually reduced in amount except in advanced cases or where infection was mixed (*i.e.*, with mastitis).

(*b*) *Deposit* should be more or less absent from normal milk and more than 1/100th c.c. (in 15 c.c. of milk) should be regarded with suspicion though up to 1/50th c.c. might be normal. With mastitis the deposit was usually white though occasionally yellow (more acute) and sometimes contained unaltered blood. The amount varied up to several c.c. in a tube.

In tuberculosis of the udder the deposit was often small—1/100th c.c. to 1/50th c.c. and often yellowish or tinged brownish orange; seldom white or with unaltered blood. The presence of a mixed tuberculous and pyogenic infection modified the usually small deposit in tuberculosis of the udder.

(*c*) The intervening fluid when normal resembles skimmed milk, is often blue and watery in mastitis of some duration and yellowish or golden in tuberculosis.

(3) Cytology

A knowledge of the cells in the deposit is of value in the study of mastitis and had been largely neglected by research workers, possibly because the disease had often been investigated by them at a distance from the cow.

Normal milk—cells were either absent or very few in number. Mostly lymphocytes (small round cells) with some polymorphonuclear leucocytes.

Mastitis—mostly polymorphonuclear leucocytes. The appearance of the slide generally was irregular.

Recovered mastitis (marked usually by slight induration)—largely irregular-shaped oval cells and some polymorphs.

Tuberculosis (udder)—smooth oval and small round cells of even appearance (macrophages or epithelioid cells and lymphocytes) and "cell groups" (giant cells), some polymorphs.

(In *very early mastitis* without visible abnormality of the milk one might find a deposit containing rather smooth oval cells, but 24 hours later these were replaced by polymorphs. This might raise a suspicion of tuberculosis until the clinical condition had progressed for a few hours and the diagnosis become obvious).

It may be convenient to tabulate the usually significant findings in the most commonly met abnormalities of the udder (recorded in order of significance where several entries are made under the same heading.)

Udder Condition	Thickening of Teat Duct	Amount of Cream	Deposit	Clot	Cytology of Deposit
Mastitis	Present after a time	Reduced if of some duration	Abundant	Usually present	Polymorphs.
Recovered mastitis	Usually present	Reduced	Slight—moderate	Absent or very minute	Irregular oval cells and polymorphs.
Tuberculosis (uncomplicated)	Absent	Normal (though reduced in very advanced cases)	Slight, sometimes moderate	Absent	Epithelioids, lymphocytes. Giant cells (*i.e.*, respectively "smooth oval cells," small round cells, cell groups), and a few polymorphs. A.f.b present.
Tuberculosis (infection mixed)	Often present	Reduced	Moderate—abundant	Often present	Polymorphs., epithelioids and giant cells (Acid-fast bacilli usually abundant and other organisms often seen)

The significance of the cytology of tuberculous milk in diagnosis was first discovered by Torrance (1922) and (1927) and later further publicised by Matthews, H. T.—both former members of this association. Torrance has never received the credit he so richly deserves as it is entirely based upon this discovery that we are able to diagnose accurately, by microscopic examination, tuberculosis of the udder in 80 per cent. or more of all suspected cases. In consequence, we were probably further ahead in our veterinary (public health) control of cases of tuberculosis of the udder than

* Cows which are hard milkers often have perfect udders, witness the severe kickers (on account of hard milking).

any other country with a similar incidence of bovine tuberculosis. The following entries from my records are typical examples of the various types of cases; the findings under each heading are in order of proportional incidence:—

Case	Quarter	Symptoms	Cream	Deposit	Cytology	Diagnosis
234	L.H.	Induration, enlargement, slight clot	1/5 in.	1/20 c.c.	Polymorphs., some lymphocytes and epithelioid cells. Streptococci present	Mastitis
255	R.H.	Enlargement and induration	1/3 in.	·5 c.c. white	All polymorphs.	Mastitis
278	R.F.	Induration and enlargement	1/10 in.	1/12 c.c.	Mostly polymorphs. and irregular oval cells	"Recovered mastitis"
288	L.F.	Induration, enlargement, heat and pain. Blood-e clots	1/10 in.	2·5 c.c. blood tinged	Polymorphs with masses of streptococci	Acute mastitis
9	L.F.	Induration and enlargement	3/4 in. "pussey" or slimy	·5 c.c. white	Polymorphs.	Mastitis
103	L.F.	Induration, enlargement. Teat duct slightly thickened. Clot	1/3 in.	1/12 c.c. blood tinged white	Round, irregular oval cells and polymorphs.	Early mastitis
97	R.H.	Slight induration	1/4 in.	1/100 c.c.	Very few cells (polymorphs.)	Normal
281	R.H.	Marked enlargement and induration	1/5 in.	1/25 c.c. blood stained	Epithelioids and lymphocytes, polymorphs. and cell groups (giant cells. Acid-fast bacilli	TB. udder
35	R.F.	Induration and enlargement	1/4 in.	1/20 c.c. blood stained	Epithelioids. Cell groups. Acid-fast bacilli	TB. udder
165	R.F.	Induration and enlargement. Clot recently	1/12 in.	·4 c.c. slightly tinged	Epithelioids, polymorphs. Cell groups. Streptococci and acid-fast bacilli	Mixed infection — tuberculosis of udder plus mastitis

Control.—Udall in the United States has been the champion of control of the disease by careful and frequent clinical examinations. One's own experience shows that much can be effected in this way and that possibly control by such means may be complete if accompanied by adherence to the "Young Herds' Plan" of Torrance (1935).

As previously indicated, incidence of infection is closely linked with age, teat patency and exposure to infection, both the latter usually increasing with age. Torrance's plan was to encourage the keeping of herds restricted to home-bred first and second calvers only, all cows being disposed of at the third calving. It was primarily designed to reduce the incidence of tuberculosis, but in practice was found also to reduce the incidence of clinical mastitis to a minimum. It is strange that this simple method of control has had no official backing from either the Ministry or the "National" in the Scheme for the Control of Diseases of Dairy Cattle. It was based on a study of the age incidence of disease in dairy cows from statistics kept in the Nottinghamshire County Veterinary department. Control may be effected by elimination of all infected cows as detected by bacteriological methods; in my experience this method is easier in small than in large herds.

My remarks have been on an aspect which you may not have chosen for yourselves, but it will now be possible for you to turn the discussion to your own liking.

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Discussion

Professor J. G. Wright: He had enjoyed the two contributions tremendously. Mr. Francis had given a splendid picture of the physiology of the mammary gland which he had found most refreshing. Towards the end of his paper, Mr. Francis had referred to the technique which he had elaborated for infecting the chick embryo with *Str. agalactiae* and then treating it with certain drugs. He had had the opportunity of witnessing him at this work and was impressed by the technique and delicacy of the operation. As for Mr. Steward, he had touched on a very heavy subject with a very light hand.

He felt that they would do better to confine their remarks to one particular aspect of the vast subject of mastitis: one could not generalise, *e.g.*, *Str. agalactiae* and *C. pyogenes* gave rise to two entirely different diseases.

As Dr. Lovell had said at an N.V.M.A. conference a few years ago, the practitioner still had a great role to play in the understanding of mastitis. He could do this by using his powers of observation to the utmost in order to determine what constant environmental factors were present where particular forms of mastitis existed. He would like to ask Mr. Francis if it was his view that *Str. agalactiae* mastitis was entirely controlled by the organism attaining the mammary gland or was it influenced by some other factor?

It was generally accepted that the incidence of *Str. agalactiae* mastitis was lower in hand-milked herds than in those which were machine milked. What was the relationship of the dirt factor to the incidence of mastitis? In considering this, we must not confuse the public health issue with that of animal health. Mr. Steward had mentioned the greater prevalence of the disease in old cows than in young ones; it must be remembered, however, when considering his suggestion of the "young herd," that older cows yielded much more milk.

Apropos environment, *C. pyogenes* mastitis was of great interest. Here there was an enormous field for clinical observation. There was the fact that it occurred mainly in summer and the non-lactating udder seemed to be much more affected. Some observant farmers were impressed by the number of flies about at the time; others said that the proximity of trees was a factor in the development of the condition. Many veterinary surgeons confirmed this view. It was an interesting fact that *C. pyogenes* could be present in many organs, *e.g.*, the uterus or the tonsil (as demonstrated by Mr. Francis) without causing serious systemic disturbance. Dr. Lovell had stated that the anti-toxic titre in regard to this organism tended to rise as cows got older. The organism was ubiquitous and yet when responsible for mastitis it set up a great toxaemia and a very fatal disease.

In conclusion, Professor Wright instanced the case of a heifer which developed *C. pyogenes* mastitis two weeks before calving. The farmer said that when it calved he would not milk it—it would get better and would be saleable as a fat cow. Experience proved this to be correct.

Major A. B. Mattinson: He felt intensely ignorant on the subject of mastitis. Certainly *Str. agalactiae* was a troublesome organism but he disagreed with the published statement that it was responsible for 75 per cent. of all mastitis. Many cows showed typical symptoms without the organism being found; he held the view that *Str. agalactiae* was not the only factor. On the other hand, examination of milk samples might show the presence of *Str. agalactiae* without any clinical symptoms. There was, in his opinion, no such thing as having a clean herd. The legal aspect interested him; how did the presence of possible latent infection affect the law of warranty?

He was not fully satisfied that infection was always *via* the teat canal, abrasions of the teats could certainly result in mastitis. Nor could he agree with Mr. Steward's principle of the "young herd"—as long as old cows were profitable there was, to the farmer's mind, no reason why he should dispose of them. If he did so, what about their progeny? It was only possible to be certain of the milking value of a cow at her third calf. He had always been in favour of the abolition of the subsidy on fat female cattle, especially dairy cows.

Mr. C. F. Shawcross instanced the case of a farmer who had recently remarked to him that the veterinary profession still had a lot to learn about mastitis. He had had a number of cows affected and all had been subjected to the same treatment in the first stage; some cleared up, some cleared without fibrosis but there was less milk, in some there was considerable fibrosis and in others there remained clots in the milk.

As regards treatment of *Str. agalactiae* mastitis, sulphanilamide was effective on some farms and not on others. Prevention was best—improved hygiene, particularly in the use of milking machines. Other predisposing causes included bad stripping (particularly if the machine was inefficient), crushed teats, passing of milking tubes, etc., and draughts. The predisposing cause gave an opportunity for the organism to develop.

Summer mastitis usually occurred in the dry cow when springing for the next lactation. When a hot day was followed by a cold night and the cow lay down, the udder got cold and this predisposed to summer mastitis.

He agreed with Mr. Steward in regard to old cows; cows would not be kept so long if the subsidy were taken off heifer beef and put on old cow beef.

Finally, what was the speaker's view of the value of vaccination? In his experience, complete vaccination of a herd, previously badly infected, had considerably reduced the incidence of mastitis.

Mr. A. J. Wright: He was most interested in Mr. Francis's remarks on the physiology of lactation, etc. He wondered what was the governing factor causing reduction in milk yield from, say, four gallons at one lactation down to one gallon at the next without apparent reason. He was surprised to learn that all the milk was present in the udder before milking commenced.

As regards mastitis, there was undoubtedly much variation in different parts of the country. In Essex, he had encountered a type which responded overnight to a dose of salts. Was this type due to *Str. dysgalactiae*? He thought that mastitis was decidedly more prevalent to-day than 40 or 50 years ago. This was due firstly to the traffic in cows and secondly to the milking machine.

Could the speakers tell him what organisms were usually present in the clinically normal udder. Was there a flora? A quick method of differential diagnosis between mastitis due to *Str. agalactiae* and *Str. uberis* would be of great value to the practitioner in deciding the line of treatment.

As regards summer mastitis, he felt that this was definitely carried by the fly and sealing the teats was of considerable value. He considered that the infection started at the teat end; in early cases often only the teat was affected and then the inflammation spread up the gland.

Since the war he had seen many cases of "hogging" in newly calved cows, often spreading right along to the brisket. This could not nowadays be due to a heavy corn ration and most of these cows were very poor milkers; possibly oat feeding was responsible.

Mr. H. P. Blackie: He just wished to mention a case he had seen of a cow with a badly lacerated udder. The quarter affected was dressed with sulphanilamide but subsequently the other quarter developed mastitis without the lacerated quarter being affected.

Mr. H. Holroyd, Junr., speaking of summer mastitis, said that this disease was of very grave importance to the farmer. Even if a cow did not die of summer mastitis, she did not milk. The Ribble valley was a hotbed of this disease; it seemed to follow the course of the river where there were many trees, etc. It occurred under these conditions far more than on moorland.

Although it was generally stated that all summer mastitis in dry cows was due to *C. pyogenes* he could say that this definitely was not the case. A large percentage of cases he had examined were due to *Str. agalactiae*, some to staphylococci and some to *C. pyogenes*.

He had found that sulphanilamide in the dry cow was of very little value. Pre-

vention, not treatment, of the condition was what the practitioner wanted. In a recent year they had attempted to carry out a controlled test with *C. pyogenes* toxoid supplied by Dr. Lovell. One group was vaccinated and another left as controls, but that year they had not had a single case of summer mastitis so no information was gained. Last year they had used Stockholm tar as a dressing for the udders of dry cows.

In conclusion, Mr. Holroyd asked if there was anything to choose, in regard to the prevention of mastitis, between the two methods of drying cows off—milking less frequently or complete cessation of all milking.

Mr. W. KENDRICK: In considering the problem of bovine mastitis one thing we had to remember was that the cow was a very unnatural animal; it was not intended to give the amount of milk that it was now compelled to produce. He had once heard an old man say that it was a mistake to control disease for when epidemics occurred weaklings died out and the strong remained.

He mentioned that many years ago he had seen some fillies affected with streptococcal mastitis, in which cases the mammary glands sloughed away.

In regard to summer mastitis, he was of the opinion that it was a teat infection. In one big herd where this disease occurred he had used the bismuth iodoform treatment and the disease died out. He had, however, given this up because of cases of bismuth poisoning. He believed that flies were responsible for transmitting infection; when there was leakage at the tip of the teat flies were attracted and infection occurred at that point. There was usually tumefaction of the teat before the actual mastitis. What was required was something to seal the teats by injection. Speaking of the examination of milk samples, he recalled having seen, years ago, quite a lot of mastitis after the treatment of cows affected with foot-and-mouth disease. Sir John M'Fadyean had undertaken the examination of milk samples and they were all sterile.

He considered that the education of the farmer was sadly lacking in regard to disease control and would like to see an agricultural institute in each county where there was a clean herd and farmers could see the milking machine properly used and the correct hygienic methods of control practised.

Mr. T. M. DOCKER: He would like to ask what was the most practicable method of laboratory diagnosis for *Str. agalactiae*. He had used both thallium acetate and Edwards's media. The latter detected most positives, the former detecting a lot of false positives when they were tested serologically.

He would also like to ask if, in the speaker's view, *C. pyogenes* toxoid was of any use in the treatment of summer mastitis or staphylococcus toxoid of any value in the treatment of staphylococcic mastitis.

The PRESIDENT, in calling upon the speakers to reply, said that he had been very interested to learn that all the milk was in the udder before milking commenced. He did not accept the view that the incidence of mastitis was less nowadays. It was an interesting fact in regard to environmental conditions predisposing to summer mastitis, that it was not encountered on the salt marshes of the north-east where there was an absence of trees.

THE REPLIES

Mr. STEWARD: In reply to Professor Wright, he would say that his remarks on control applied only to *Streptococcus agalactiae* infection as that was an obligatory parasite. It was impossible at present to eradicate diseases due to saprophytic or commensal organisms, which were facultative pathogens. In connection with the importance of environment, dirt as such alone was of no importance in the absence of the causal organisms.

Major Mattinson's remarks about the variable incidence of *Str. agalactiae* agreed with his own experience; for instance, *Str. agalactiae* mastitis was uncommon in Herefordshire until the advent of the Milk Marketing Board had encouraged commercial dairy herds which now outnumbered the beef herds. Some people would object to the disposal of third calvers but it depended on whether one gave disease eradication priority or not. Once the herd was disease free and being so maintained, older cows could be kept; the "young herd plan" was only an interim measure.

He agreed with Mr. Shawcross that the beef subsidy should have been given for old cows and not young cows on heifers. The value of vaccination was hard to assess on account of many variable factors in the course of the disease.

In replying to Mr. A. J. Wright, "hogging" or oedema was thought by some to be pathognomonic of staphylococcal infection, but that was not his experience. Spontaneous recoveries soon after administration of ineffective treatment often gave false credit to treatments which were not of significant value.

The observations of Mr. Kendrick, Mr. Holroyd, Junr., and others on the high incidence of Corynebacterium mastitis in the well-watered and shady valleys and low on the open, wind-swept moors might be connected with the incidence of "sipping" flies (Muscidae) which liked shade and shelter, or even with *Simulium* which bred in running streams and bit the udder and teats. It was quite possible that, as observed by Mr. Kendrick, the dry cow might stimulate milk secretion by licking her fly-bitten teats and thus favour the aetiology of the disease.

Mr. Callender's observation of the absence of Corynebacterium mastitis from cows on the salt marshes might be associated with absence of flies—*Simulium* would be absent unless swift running streams or fresh rivers were nearby, and Muscid flies might not be prevalent. Mr. Kendrick's observations were extremely interesting and were complete and so needed no answer.

Mr. FRANCIS: He had enjoyed listening to the views put forward by the different speakers, which were based on a wide experience of the disease.

He had been chiefly talking about mastitis due to *Str. agalactiae* but, as Major Mattinson said, it was probable that the various other organisms were responsible for a larger proportion of mastitis than had been supposed. He agreed with Professor Wright's suggestion that the entry of *Str. agalactiae* into the udder did not necessarily produce mastitis, but we were still very ignorant as to why some quarters became infected and others did not. To pose this question was asking a great deal; in an influenza epidemic we did not know why certain people are affected and others not. It was obvious, however, that environmental conditions were important, and it was known that *Str. agalactiae* was sometimes eliminated from infected quarters, the presence of dirt was usually associated with careless management and therefore injury to the teats or udders. It would probably be accepted that mastitis due to *Str. agalactiae* was nearly always a disease passed from one milking cow to another, and that infection was *via* the teat canal. The "ideally normal" udder was sterile and such udders did exist but many quarters which should almost certainly be classed as normal contained micrococci.

He had been interested in the views put forward concerning the route of infection in *C. pyogenes* infection. This organism could often be found in the tonsil, and was commonly found in abscesses in the internal organs, or in abscesses over the buttocks where the skin had remained unbroken. He had therefore felt that *C. pyogenes* mastitis might be an endogenous infection, but there seemed to be strong circumstantial evidence that it was often transmitted by flies.

It was difficult to assess the value of vaccination against streptococcal mastitis but there was very little good evidence to show that any immunity was produced.

Mr. Wright's observation that "hogging" (oedema of, and anterior to, the udder) was more common in war-time was interesting. Starvation oedema due to the lowered osmotic pressure of the blood plasma was well recognised in Europe during and after the last war, and it was no doubt occurring again. The increased incidence of "hogging" in cows might possibly be due to poor war-time feeding.

The statement that all the milk obtained at any one milking was present in the udder before milking began, was based on good experimental evidence.

He had no wish to suggest that mastitis was less common now than formerly, but only that it always had been a common disease, and that the impression that it had increased during recent years might only be due to the larger proportion of dairy cows and the greater interest taken in the control of mastitis.

The Examination of Milk Samples for Mastitis

The Comparative Value of Deep Blood Plating and Incubated Smears in Diagnosis

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INTRODUCTION

In a previous article (Rowlands and Field, 1943) the value of the incubated smear method was compared with cultural examination using thallium acetate glucose broth for the diagnosis of *Str. agalactiae* mastitis. It was decided, in view of the favourable result obtained, to compare the value of incubated smears with the method of deep blood plating. The latter is a standard method adopted for the examination of routine samples in many laboratories and is much more commonly used than thallium acetate broth. It was felt that if as favourable results were obtained in such a "series examination" as we previously experienced, it would considerably enhance the value of the incubated smear technique as a standard method for the examination of routine milk samples for *Str. agalactiae* infection, in particular.

MATERIAL

The milk samples forming the subject of this comparison were from routine herd examinations and were taken either by a member of the laboratory staff or by private practitioners. The majority were quarter samples. 1,080 such samples have been examined by both methods.

TECHNIQUE

Upon receipt in the laboratory samples were allowed to stand in the refrigerator overnight or for a sufficient time for the cream to rise. One triple loopful (0·01 c.c.) of cream was deep plated into 10 per cent. sheep or ox blood agar. Plates were incubated and observed at 24 and 48 hours. Plates showing typical beta haemolytic colonies were accepted as *Str. agalactiae* without further examination. Suspicious and non-haemolytic colonies were picked off into serum broth, incubated, and any deposit examined microscopically. Where necessary precipitin tests and fermentation reactions were carried out. The remainder of the milk was used for incubated smear examination using the technique previously described. Particular attention was paid to the cellular content of the milk and the presence of leucocytes carefully noted. Samples were only considered positive when streptococci having the typical morphology of *Str. agalactiae* were present, regardless of the cytological picture.

RESULTS

TABLE I

Total No. examined	..	1,080	
Str. agalactiae absent in	..	820	75·9 per cent.
Str. agalactiae present in	..	260	24·1 „
Positive smear / culture	..	193	(74·2 „)
Positive smear / Negative culture	..	39	(15·0 „)
Negative smear / Positive culture	..	28	(10·4 „)
Total No. detected :—			
By smear	..	232	(89·4 „)
„ culture	..	221	(85·0 „)

Of the 1,080 samples examined, *Str. agalactiae* was found present in 260 (24·1 per cent.) by one or both methods. 232 (21·5 per cent.) were positive by incubated smear and 221 (20·5 per cent.) by blood plating, complete agreement being reached in 193 (18·0 per cent.). Thus of the 260 positive samples, 28 were positive by deep blood plating only and 39 positive by incubated smear only.

Haemolytic *Str. agalactiae* were responsible for 260 of the samples positive by the blood plate method, the remaining 21 being non-haemolytic strains.

Of the 232 samples positive by incubated smear, 183 had an increased leucocytic content, while 49 (21·1 per cent.) had no marked cellular content. As some of the routine samples were taken after udder irrigation no results were given to indicate the number of smears which had an increased cellular content but in which *Str. agalactiae* were not observed, although in such samples there is often a mixture of endothelioid cells and leucocytes.

Discussion

From the results obtained it can be seen that the incubated smear method can be accepted as a reliable technique for the routine examination of milk samples for *Str. agalactiae* mastitis and in our hands compared quite favourably with two of the common methods used in this country, *i.e.*, deep blood plating and culture in T.A.G.B. Its advantages over blood plating are many. The technique of incubated smear examination is simple and *with a little practice* reasonably accurate results can be obtained. The reading of deep blood agar plates for *Str. agalactiae* is an easy matter when typical haemolytic colonies are present but if non-haemolytic colonies are present they can easily be overlooked, and, if not, their final detection involves much work, media and time. The percentage of non-haemolytic *Str. agalactiae* which we found was low as compared with the results obtained by other workers. This may point to the fact that we have failed to detect a number of samples containing a small number of non-haemolytic *Str. agalactiae*. This is quite possible when contaminants are present. As was pointed out in a previous article, the cellular picture observed by the smear method gives very valuable indication as to the probable duration of the infection and its intensity, which is invaluable in the institution of control measures in a herd.

A few milk samples with a high leucocytic content were positive in blood agar but negative on smear examination despite prolonged incubation. This appears to point to a state of equilibrium existing in the sample between the streptococcus and the milk. We have found that the most essential factor for success by the incubated smear technique is that the samples should be taken with great care to avoid any contamination, extraneous organisms rendering the examination of smears after incubation a difficult if not hopeless task. If any degree of contamination is present the more rapidly growing organisms tend to crowd out any *Str. agalactiae* present, which, if seen, appear as very short chains, and one hesitates to diagnose *Str. agalactiae* infection on this atypical morphology. Provided that the *Str. agalactiae* is haemolytic it gives better results than smear examination when any degree of contamination exists, but with similarly contaminated samples where non-haemolytic *Str. agalactiae* are present the reading of blood plates is equally difficult.

A remarkable instance of the sensitivity of smear examination was seen in one series of twelve samples. Four showed the presence of very many chains of *Str. agalactiae* by incubated smear. Three of the four samples in deep plates showed four, three and two haemolytic colonies respectively while the fourth was negative.

Another great consideration is the time which elapses between the receipt of the samples and the despatch of results. By using incubated smears, samples can be reported upon within 24 hours of their receipt, while a week may elapse before one finally completes examination using plates, particularly if many non-haemolytic colonies are found.

To carry out any large-scale policy of mastitis control, periodic routine examination of individual samples from herds is essential. The amount of labour, time, material and the expense involved in deep blood plating makes this method impracticable for general application. On the other hand, the examination of incubated smears could be very well adopted by practitioners in this country as is being done in America by practitioners engaged in mastitis control work. Smears are quickly made and examined. The temperature of the samples can be raised to, and maintained at 37°C. without resort to incubators but with the aid of a little ingenuity.

Herd sampling could well be carried out at the time of the routine three-monthly visit to farms under the Survey Scheme. This would probably take less time than palpation of udders but would yield considerably more information. On the basis of the results obtained, segregation methods could be applied to the herd. We feel that if four examinations each year could be made in this way, the problem of chronic contagious mastitis could be made to show a remarkable improvement on the present position.

At the present time, laboratory facilities are not available for the mass examination of herd samples, and in the diagnosis of mastitis practitioners rely on clinical examination. We feel that by the time *Str. agalactiae* infection can be diagnosed by udder palpation, the disease is well established in the udder (and probably in the herd). The efficacy of control and treatment depends on the infection being recognised at the earliest possible moment. This can only be done by bacteriological examination; for this the smear examination of incubated smears is eminently suitable.

Acknowledgment.—Our thanks are due to Mr. W. T. Rowlands for helpful criticism.

Reference.—Rowlands, W. T., and Field, H. I. *Vet. Rec.* **55.** 52.

At the close, in January, of his term of Presidency of the National Farmers' Union, Mr. J. K. Knowles will formally become General Secretary.

CLINICAL COMMUNICATION

Acute Orchitis in a Shorthorn Calf

H. E. WILLIAMS-JONES, M.R.C.V.S.
Ruthin

The eminent authority, W. L. Williams, in his "Diseases of the Genital Organs," 3rd edition, 1943, infers that although orchitis is not uncommonly found in the adult bull, few cases are on record of its occurrence in the young and immature calf.

He, however, describes a similar case in a bull calf with abscessation of the epididymes and vasa deferentia.

Subject.—Shorthorn calf, six weeks old.

History.—When the calf was five weeks old the owner observed a purulent discharge coming from the umbilicus, and three days later the scrotum appeared tense and very swollen. Although appetite was unimpaired, slaughter was advised and the carcase was dressed.

Observations.—Macroscopically, the left testicle, liver, kidneys and other organs were normal. The right urino-genital tract, however, was considerably enlarged and distended with pus. The right spermatic cord was about three times its normal size. The right scrotal sac contained a hypertrophied epididymis and vas deferens; it was distended with pus and weighed 14 oz. unopened. The penis and sheath were also swollen.

Unfortunately, no microscopic examination of the pus was undertaken.

I am much indebted to the meat inspector who kindly assisted me in the dressing of the carcase.

ABSTRACTS

[Caesarian Section and Torsion of the Uterus in Cows. Gendreau, L. A. (1944.) *Canad. J. comp. Med.* **8.** 125-127.]

Caesarian Section.—It is generally held that Caesarian section in the cow is rarely successful but it is probable that this is mainly because it is used only as a last resort. The author does not hesitate to perform the operation in any case of malformation or difficult parturition in which there is a likelihood of injuring the cow. The operation is carried out in the stall whenever possible and the only restraint is provided by a man at the animal's head—and even this is usually necessary only while the flank incision is being made. The use of general anaesthesia in any form is fatal. The method used by the author consists of injecting 10 c.c. of a 2 per cent. solution of any good local anaesthetic between the first and second caudal vertebrae and infiltration of the site of the flank incision with 30 to 50 c.c. of the same anaesthetic. The flank incision is on the right side and is made in turn through all layers for a length of 15 to 20 inches. The uterus is opened by an incision in the dorsal surface and the calf is delivered by traction on the hind legs by an assistant using obstetric chains. The incision in the uterus is washed with saline and sutured with No. 0 or No. 1 catgut, using continuous Lembert sutures. Two rows of sutures are used, the second being a reinforcing row. To provoke expulsion of the placenta the corpus luteum is expressed and 20 mg. of stilboestrol is injected intramuscularly. It may be useful to sprinkle 10 g. of sterile crystalline sulphanilamide (for internal abdominal use) in the abdominal cavity before closing the abdominal wound. The abdomen is closed with a single row of interrupted sutures through peritoneum, muscles and skin. The sutures are removed on the eighth to tenth day.

Torsion of the Uterus.—Anaesthesia and the site of the abdominal flank incision are exactly as for Caesarian section. The incision is made sufficiently long (usually 6 to 8 inches) for the right arm to be introduced. An obstetrical sleeve with glove is worn. It is usually easy to untwist the uterus by suitable manipulation with the hand and arm, the direction depending on whether the torsion is to the right or left. The subsequent procedure is identical with that for Caesarian section. Occasionally, owing to insufficient dilatation of the os uteri or damage to the uterine muscle, the calf cannot be delivered *per vaginam* and it may be necessary to remove it by Caesarian section. E. G. W.

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[Ulcerative Lesions of the Bovine Rumen and their Possible Relation to Hepatic Abscesses. Smith, H. A. (1944.) *Amer. J. vet. Res.* **5.** 234-242. (14 refs., 4 figs.).]

The estimated loss through condemnation of bovine livers because of "abscess formation" by Federal Meat Inspectors alone in the United States is two million dollars yearly, the incidence averaging 5·25 per cent. of all slaughtered cattle.

In reviewing the literature *Actinomyces necrophorus* appears responsible for most cases, but pyogenic bacteria, including *Coryne-*

bacterium pyogenes, streptococci, staphylococci and *B. coli,* have also been reported.

The investigation of lesions found in rumen and reticula of 1,807 cattle (other stomachs yielding no significant lesions) was made by Smith to check the source of the liver lesions as being *via* the portal circulation.

He classifies the lesions into eight types varying from "adherent contents" to highly inflammatory processes with diphtheritic exudate and pseudomembranes, etc., to scar formation and "submucous nodules."

Percentage findings were 26 with rumen lesions and 18 with liver abscesses.

Of 474 with rumen lesions 42 per cent. had liver abscesses and only 9 per cent. of the remainder (1,333) had such lesions.

Of 322 with liver abscesses 62 per cent. had rumen lesions and only 18 per cent. of the remainder (1,485) showed such lesions.

The low incidence of foreign bodies in this investigation probably resulted because most of the subjects were range-raised beef animals and not dairy cows kept longer in barnyard surroundings where metallic objects would be more accessible.

Bacteria found in stained sections of the liver and rumen lesions appeared similar and generally supported *A. necrophorus* as being the probable aetiological factor.

Smith claims that his evidence supports his theory of a relationship between rumen ulcers and liver abscesses in beef cattle.

C. V. W.

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[Preisz-Nocard Disease: Small Outbreak in Horses. *Canad. J. comp. Med.* (1944.) **8**. 3-10.]

Corynebacterium ovis infection of horses, apart from a few cases in animals returned from the Great War, was not known to occur in Canada, and lesions of caseous lymphadenitis in sheep are very rarely seen there. Great importance, therefore, attaches to the discovery of six clinical cases in a small isolated herd of eleven horses on the prairies of the province of Saskatchewan, from which *C. ovis* was recovered by guinea-pig inoculation. Ten of the eleven horses in the herd, including the six clinical cases, carried neutralising antibodies for *C. ovis* toxin in their serum, as did three horses that had been in indirect contact with experimentally infected animals (a horse and a goat), and two horses in another isolated herd of 16 animals with no history of the disease. The source of infection in the outbreak was not determined, but the occurrence of *C. ovis* antitoxin in horses apparently never clinically infected or exposed to infection suggests that the infection may exist in Canada in an inapparent form, and only become manifest under unfavourable conditions, such as the cold and mud of the last war.

E. C.

* * * * *

[Observations on Heartworm in British Racing Greyhound Kennels in Nassau. Brown, H. C. (1944.) *J. Amer. vet. med. Ass.* **104**. 325-327.]

A number of valuable British racing greyhounds were exported to Nassau in 1941 for the safe keeping and perpetuation of certain blood lines. From 14 such adults about 50 normal healthy pups were born and raised in the kennels 15 miles from the city limits. There are small negro settlements in the vicinity of the kennels where native-owned mongrels wander and are known to be infected with heartworm (*Dirofilaria immitis* which is transmitted by mosquitoes).

All mature dogs were kept in screened kennels but the pups were allowed to run in large open paddocks although the pups had been kept in screened kennels until weaned at about two months old.

It was found that puppies first showed microfilariae in the blood at approximately eight months old, whilst the interval between first possible exposure to infection and the first positive blood examination in adults was ten months. The difference is attributed to the protection afforded by screening the adult dogs' quarters. As the puppies were kept in screened kennels for two months after birth it is assumed that six months is the minimum period between infection and the appearance of microfilariae in the blood. (The validity of this argument rests entirely upon the assumed reliability of the anti-mosquito screening.) All the dogs and puppies became infected in the course of time.

Treatment varied, according to age, health and size of the dog, between the use of Filzol, Fuadin and cured leaf tobacco; the last was given orally to dogs too old and heavily infected for hypodermic treatment. For these older dogs with advanced clinical symptoms of bronchial cough and shortness of breath the use of cured leaf tobacco for a short time on a low fat diet often eliminated the more advanced symptoms providing the animal did not vomit the tobacco. Treatment completed before breeding did not generally interfere with conception but most aborted and the remainder whelped weakly pups. It was observed that six months should elapse between completion of treatment before breeding in order to ensure a normal litter.

J. S. S.

Questions and Answers

"Questions and Answers" will be published on alternate weeks.
The submission of questions for inclusion in this column will be welcomed. They can relate to any aspect of veterinary work and where publication of the name of the enquirer is not desired, a pseudonym should be supplied, the name and address also being given.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

Contagious Abortion Control: Use of Strain 19

Q.—"*When using Strain* 19 *Vaccine for the control of contagious abortion, is it necessary to revaccinate for each successive pregnancy?—T. E. H.*

A.—It has been proved conclusively that vaccine prepared from *Br. abortus* Strain 19 confers an immunity of high order against infection with cultures of *Br. abortus* of full virulence. There is a lack of information, based on controlled experiments, concerning the duration of immunity following a single dose of the vaccine. American observations indicate that calfhood vaccination is followed by immunity lasting for some years. Whether revaccination should be carried out and at what interval after the first injection remains to be investigated. On general immunological principles, however, the immunity following two stimulations properly spaced is of higher order and of longer duration than that induced by a single treatment. In many animals the primary stimulus (first dose of vaccine) will be further stimulated by exposure to natural infection. Where there is reason to believe that such exposure has not taken place consideration might well be given to the injection of a second dose of vaccine, preferably after the first calving, since the second pregnancy seems to be the most dangerous period in this country. There does not seem any necessity to revaccinate for each successive pregnancy.

. . . . .

Subcutaneous Injections of Boro-gluconate for Milk Fever

Q.—*Considerable differences of method exist in the subcutaneous injections of boro-gluconate for milk fever.*

(*a*) *What are the ideal proportions of boracic acid and boro-gluconate in the injection?*

(*b*) *If a stock solution is held in the surgery, what is the best preservative, and in what strength?*

(*c*) *Is there any real advantage in injecting the solution at about blood heat, and if so, what is the best method of preparing this?*—"*Practitioner.*"

A.—Calcium gluconate is one of the few readily soluble and absorbable calcium salts, but needs some preservative to prevent its precipitation. Boric acid is the agent of choice, and the exact proportions do not seem to matter a great deal.

Opinions as to dosage and dilution vary from district to district, but it is probable that the disease has the same property of variation and it is advisable to be guided by the usual method in the district.

Doses of from two to five ounces of calcium gluconate are used with about half an ounce of boric acid. It is advisable not to use a very concentrated solution or absorption is retarded and local irritation in the tissues may result in a slough. The writer uses 3½ oz. of boro-gluconate in 350 c.c. of sterile water and the results are generally satisfactory. Generally one such injection is given intravenously and another subcutaneously. Some practitioners prefer a greater dilution, giving the salt in up to two pints of water. This is probably undesirable, as it is dangerous to give such a large volume of fluid intravenously and cumbersome to give it subcutaneously.

It is unnecessary to add boric acid to boro-gluconate—this has already been done. Stock solutions (if properly sterile) will keep for a long time without other preservative if kept at a fairly warm temperature.

If the injection is given at blood heat, it is probable that there is less local tissue irritation and absorption is quicker, but the writer regards warming as an unnecessary precaution, except perhaps in very cold weather when the solution may be almost freezing. The simplest method is to dip in a pail of warm water and allow to stand for a short while.

. . . . .

Foul of the Foot in Cattle

Q.—*What is an effective method of treating foul in the foot in cattle: apart from conditions of hygiene is there a reliable way of preventing spread of the disease in a herd?—Veterinarian.*

A.—Foul in the foot in cattle due to the *fusiformis necrophorus* is well treated by the administration of sulphanilamide per os. The local lesion is relieved by setting the digits of the affected

foot by means of a pair of hoof clippers and a double-edged cutting foot knife. The inner edge of the wall of each digit is lowered with the knife and the solar surface and outer wall are clipped, so that pinching of the interdigital tissue is avoided when walking.

This procedure also helps to eliminate spurious "foul" and so aids in the differential diagnosis.

In the initial inflammatory stage a good blistering with hydrarg. biniodide hastens the delineation of the necrotic tissue.

Removal of the necrotic slough from the interdigital space and dry dressing with sulphanilamide is often all that is required further to ensure recovery.

Stabilisation of the affected is the best way of preventing the spread of the disease in a herd. This leaves open the question of how the first member of the herd became affected.

As the *fusiformis necrophorus* is also the cause of calf diphtheria, and multiple necrosis of the liver, preventive medicine is set a problem which is as yet unsolved.

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Prescription for Dispensing Camphor and Ether in Oil

Q.—*Would you please give a prescription for dispensing my own camphor and ether in oil for hypodermic use?*—"*Bench.*"

A.—A suitable prescription would be Camphor 1, Ether 2, Olive Oil (sterilised) 4. Sterilisation of the oil consists in keeping it at a temperature of 150° F. for an hour and should of course be done before the preparation is made up.

. . . . . .

"Tuson's Spirits of Hydrarg. Perchlor."

Q.—*What is Tuson's Spirits of Hydrarg. Perchlor?*—"*Enquirer.*"

A.—This is probably a misnomer for Liquor Hydrarg. Perchlor. (Tuson) which is Hydrarg. Perchlor. grs. 3 to 6, Water fl. oz. 1, and is therefore from 6 to 12 times the strength of Liq. Hydrarg. Perchlor. B.P. the strength of which is 1 : 1,000.

. . . . . .

Restraint in Handling Silver Foxes

Q.—*What method of restraint do you advocate for handling silver foxes?*—"*Safety First.*"

A.—The veterinary surgeon should leave the catching and securing of a silver fox to the fur farmer. Each has his own technique of holding the animal for examination by the veterinary surgeon; some foxes require two men to hold them. Examination, while thorough, must be expeditious; and a table is of advantage. But the fox should not be secured to a table unless for anaesthesia preceding operation.

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CORRESPONDENCE

Infectious Feline Enteritis

Sir,—If I may be allowed to reply further to your querist, W. H. Lambert, *re* prevention of this disease, it is my experience that if kittens when about a month old are dosed with equal parts of pulv. calomel and santonin they will never contract the disease, even if kept on premises where infection exists.

For those practitioners who board cats it will be found a sound practice to dose with this mixture all animals under one year old immediately on arrival at the cattery.

I might conclude by adding that I know of no cure for the disease.

Yours faithfully,

Warren Road, Reigate. S. E. Holmes.
October 21st, 1944.

. . . . . .

Pseudo-Pregnancy in the Bitch

Sir,—I cannot agree with the reply published in "Questions and Answers" as to the method of using stilboestrol in pseudo-pregnancy in the bitch.

A dose of 1 mg. stilboestrol is only an average, certainly not a large, dose for a dog, and would therefore be more likely to increase milk secretion than inhibit it. Miss Brancker, in her paper "Stilboestrol in Veterinary Practice," recommends a dosage of 5 mg. twice daily by the mouth for a terrier. I have used doses ranging from 3 to 6 mg. twice daily in various types of dog, in most cases with good results, but have found an occasional bitch which vomits these large doses.

In my experience it is essential to initiate treatment at about 49 days after the end of oestrum and not to wait until mammary activity is at its height; 49 days is the period at which the abdominal distension of pseudo-pregnancy suddenly disappears. A four-day course of the suggested large doses of stilboestrol is usually sufficient, and owners should always be warned to watch for signs of oestrus in three to seven days.

Yours faithfully,

78, Brentway, Finchley, N.3. Joan O. Joshua.
October 24th, 1944.

. . . . . .

Head (Notoedric) Mange in the Cat

Sir,—I have found "Ascabiol" (May & Baker) an excellent remedy for the above complaint, but in a mixed infection of notoedric and sarcoptic mange I have had the best results from calcium sulphite, applied at 110° F., at intervals of five days.

Yours faithfully,

Ty Gwyn, Old Colwyn, North Wales. F. Booth.
October 25th, 1944.

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Treacle for Electuary, etc.

Sir,—For some time I have been unable to obtain treacle for use in electuary.

On reading the "Questions and Answers" of your issue of September 23rd last, I wrote to the Molasses and Industrial Alcohol Control for a permit.

A reply was duly received stating they were not concerned with treacle, but that I should write to the Animal Feeding Stuffs Division of the Ministry of Food, Colwyn Bay.

As a result of my letter to them a permit has now been supplied by the Local Food Office, Bermondsey, on the instructions of the Ministry of Food, Colwyn Bay.

I may say that a previous application had been refused by the Local Food Office, so it would appear that permits for treacle are only granted on the direct instructions of the Ministry of Food, Colwyn Bay.

Yours faithfully,

Bricklayers' Arms Station, C. Norman Thompson.
Old Kent Road, London, S.E.1.
October 23rd, 1944.

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Mr. A. Hart, M.R.C.V.S., of Ardnadum, Dunoon, writes to point out that, owing to an erroneous rendering, the reference in his letter, on p. 377, to the statement made to him by a dentist, is incorrect in one particular. The sentence in question reads: "He stated that pressure had a great effect in producing local anaesthesia in dental work and that even with distilled water and using a dental syringe one could extract a tooth without the patient feeling pain, but he had never tried this method." What Mr. Hart meant to convey was that he himself had never tried the method: the dentist assured him that he had carried out the procedure.

WORLD STANDARD FOR PENICILLIN

Sir Henry Dale, President of the Royal Society, announced recently that an international agreement on a world-wide uniform standard and unit of penicillin has been reached by the Health Committee of the League of Nations. The agreement was arrived at by a conference in London attended by representatives of Britain, the United States, Canada, Australia, and Free France, with the advice of Sir Alexander Fleming, the discoverer of penicillin, and other specialists from South Africa and India.

Sir Henry Dale said that there could not be any doubt now that workers on both sides of the Atlantic, and eventually in the whole world, would be using this same standard dosage. Agreement on this important point would be a great advantage in the further development of penicillins. Referring to "loose talk" about trade rings in the manufacture of penicillin in Britain, Sir Henry Dale said that "from the very first manufacturers in this country had entered into a friendly agreement with one another that they would all work together, pool all their information, give all their results to the Medical Research Council, and make the manufacture a genuinely national effort."

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Weekly Wisdom

"*How fleeting are the wishes and efforts of man! how short his time! and consequently how poor will his products be, compared with those accumulated by nature during whole geological periods. Can we wonder, then, that nature's productions should be far 'truer' in character than man's productions; that they should be infinitely better adapted to the most complex conditions of life, and should plainly bear the stamp of far higher workmanship?*"—Darwin, "Origin of Species," 1859.

QUESTIONS IN PARLIAMENT

Colonial Services (Leave)

Captain Duncan asked the Secretary of State for the Colonies what arrangements are being made as regards the grant of leave to members of the Colonial Service, bearing in mind the amount of work likely to be involved in post-war development in the Colonies and the disorganisation which would result from the absence of a considerable part of the staffs for long periods.

Colonel Stanley: Local conditions and individual circumstances vary too greatly to enable any rigid rule to be laid down, but I have asked Governors to deal with this question as far as may be practicable on two general principles: First, that officers who have put in long and strenuous service during the war should have reasonable leave as soon as possible; second, that, for the reasons suggested in the Question, the length of leave granted on the first post-war occasion should be limited.

* * * * *

African Colonies: Development Commissions

Mr. Riley asked the Secretary of State for the Colonies whether he has under consideration any scheme for the establishment of similar development commissions for West and East Africa, respectively, as the Stockdale Commission now operating in the West Indies.

Colonel Stanley: No, Sir.

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Central Africa (Proposed Standing Council)

Sir J. Mellor asked the Secretary of State for the Colonies whether the secretariat of the proposed Standing Central African Council will be established in headquarters at Salisbury, Southern Rhodesia, and how will the expense be apportioned between the territories concerned.

Colonel Stanley: A preliminary meeting between the three Governments concerned is to be held to consider the arrangements for the setting up of the Council, but I am not yet in a position to make a statement.

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Medical Research

Mr. Salt asked the Minister of Health to what extent questions of medical research will be dealt with in the National Health Scheme on which his department is now working.

Mr. Willink: The encouragement and assistance of research will continue to be primarily the function of the Medical Research Council which was set up by Royal Charter for the purpose. It is the Government's intention that research and opportunities for research should be continually developed with the help of the Council.

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Greyhound Tracks, London (Malpractices)

Mr. W. J. Brown asked the Secretary of State for the Home Department what steps the Metropolitan Police are taking to protect the public from malpractices on greyhound racing tracks in the London area.

The Secretary of State for the Home Department (Mr. Herbert Morrison): Greyhound racing tracks are private premises, and the primary responsibility for the protection of the public against malpractices rests with those who conduct the races. The police are, however, always ready to investigate all cases in which they receive information that fraud is taking place, and to take such action as may be possible on the evidence obtained.

Mr. Brown: If I bring to the notice of the Home Secretary information which suggests that the present protective measures are inadequate, will he investigate it?

Mr. Morrison: If the hon. Member will give me particulars, I will certainly have them investigated.

Governor Herbert L. Lehman, Director-General of U.N.R.R.A., says that "the fight against privation, disease and the destruction which the enemy has wrought is only just beginning." "Let the world not be deceived by reports from portions of the areas already liberated, indicating that the suffering in a particular community or group of communities has not been so great as had been thought. These reports are far outweighed by others, which indicate that the enemy has been even more ruthless than had been known or anticipated."

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Nov. 8th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 2.30 p.m.

Nov. 16th.—Meeting of the South-Eastern Division, N.V.M.A., at Tonbridge (Rugby Football Club), 2.30 p.m.

Nov. 25th.—Annual General Meeting of the Society of Women Veterinary Surgeons, in London (69, Great Peter Street, S.W.1), 2.15 p.m.

Nov. 29th.—Meeting of the Royal Counties Division, N.V.M.A., at Reading (The University).

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New Cars for Veterinary Surgeons

In response to enquiries addressed to the Minister of War Transport on the matter, the Association is informed that it has been decided that, as and when production recommences, the veterinary profession will be accorded some degree of priority in the allocation of new cars.

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PERSONAL

Birth.—Townson.—On October 22nd, at St. Austell, to Beryl (*née* Hughes), wife of Robert S. Townson, M.R.C.V.S.—a daughter.

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Marriage.—Wyse—Williams.—At the Methodist Church, Chapel Street, Oswestry, on October 26th, 1944, George Wyse, M.R.C.V.S., 26, Willow Street, Oswestry, to Rebecca Williams, 5, Clifford Gardens, Oswestry.

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Mr. Alex. Dobie leaves Birkenhead.—In a recent issue the *Birkenhead News* speaks of the regret with which the farmers of Wirral will learn that Mr. Alexander Dobie, M.R.C.V.S., of 27, Shrewsbury Road, Birkenhead, is leaving to take up a new appointment with a private firm in London. His departure will break an association with Birkenhead of nearly a century, for his father and grandfather both practised as veterinary surgeons there before him.

Mr. Dobie qualified before the last war and then joined up, serving in France and Macedonia with the 107th Brigade, Royal Field Artillery. He has been in practice in Birkenhead for 25 years, since his demobilisation. In addition to general practice he has also been veterinary surgeon to the Ministry of Agriculture and Fisheries for Wirral and the Port of Liverpool area, where he is a well-known figure. He is a past-president of the Birkenhead Rotary Club.

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University of Edinburgh Degree of B.Sc. (Vet. Sci.).—At a recent graduation ceremony held in the University of Edinburgh the following students of the Royal (Dick) Veterinary College received the degree of B.Sc. (Vet. Sci.): Andrew John Clarke, John Davie, John Kenneth Dealtrey Dow, Leslie James Park Duncan, Gordon Stewart Ferguson, George McCurrach Gibson, Richard Jobling, Geo. Edward Moorhouse Latimer, John Letham, Kenneth John Ramsey McLennan, Frank Charlton Moody, Donald Ian Nisbet, Hugh Maxwell Scott, Peter Dennis Irving Thomas, John Alex. Geo. Walker.

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R.C.V.S. OBITUARY

Crowhurst, James William, F.R.C.V.S., Major late S.A.V.C., 17a, Waterkant Street, Cape Town, South Africa. Graduated London, December 21st, 1887; Fellowship April 26th, 1893. Died at Rondesbosch, Cape Town, September 19th, 1944; aged 77 years.

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GENERAL OBITUARY

Mr. Falconer L. Wallace

The tragic death of Mr. Falconer L. Wallace, of Candacraig, Strathdon, from injuries sustained through falling into the well of a lift in a hotel at Perth, will be deeply regretted by the many members of the profession who knew him, mainly through his activities in connection with the Animal Diseases Research Association, of which he was President.

Mr. Wallace was a son of the late Mr. A. F. Wallace, of Candacraig, who was a director of the Bank of England, and he was himself engaged in financial business in London, but in agricultural circles he was well known for over 30 years through his interest in pedigree livestock breeding—Shorthorn and Aberdeen-Angus cattle, Clydesdale horses and Blackface sheep. Through his long connection with livestock breeding Mr. Wallace had first-hand experience of how disease could frustrate the efforts of breeders and how great a loss was caused to the nation through disease; and that no doubt was responsible in part for the enthusiasm with which he participated in the work of the Animal Diseases Research Association, to which he gave generous financial support. He was a member for over 30 years of the Highland and Agricultural Society of Scotland, and for a time Vice-President; while he was an active supporter of the Royal Northern Agricultural Society, and the Strathdon and other local agricultural societies. He was a Deputy Lieutenant of the County of Aberdeen, and on two occasions he contested East Aberdeenshire as a Parliamentary candidate.

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VACCINATION OF CALVES AGAINST CONTAGIOUS ABORTION

Ministry's Scheme to be Introduced on December 1st

We have received, as we go to press, the following announcement from the Ministry of Agriculture:—

"Every registered dairy farmer in Great Britain will receive shortly from the Divisional Veterinary Inspector of the Ministry of Agriculture particulars of a voluntary scheme for the vaccination of heifer calves against contagious abortion that will come into operation on December 1st. Vaccination offers the best means of controlling contagious abortion and the Ministry hopes that dairy farmers will take full advantage of the scheme.

"The charge to the farmer will be one shilling per calf and the vaccination will be carried out when a veterinary inspector visits the farm for the purpose of inspecting the dairy herd.

"The Ministry's No. 1 vaccine made from Strain 19 will be used for the purposes of the scheme. Experience in the United States of America has shown that the vaccination of heifer calves over the age of four months with vaccine made from this strain confers a high degree of immunity from contagious abortion extending over several calvings. Experiments as well as field experience in Britain have shown that vaccine prepared from the same strain is at least equally as effective when heifers are vaccinated later than the age of calfhood.

"The use of a live *Brucella abortus* vaccine in herds in England and Wales licensed for the production of tuberculin tested milk has for the past two years been limited to infected herds and then only with one of two approved vaccines. The Ministry's No. 1 vaccine may now be used in these herds for both heifer calves and older female animals whether the herd is infected or not. In Scotland, animals in herds licensed for the production of certified or tuberculin tested milk may be vaccinated with live *Brucella abortus* with the consent of the local authority."

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TRYPANOSOMIASIS RESEARCH COMMITTEE

The Secretary of State for the Colonies has appointed a tsetse fly and trypanosomiasis committee to consider and advise on the co-ordination of action, including research, directed against human and animal trypanosomiasis, and, in particular, against the tsetse fly as the chief vector.

The committee, on which the Dominions Office and the Sudan Government are represented, will report from time to time to the Secretary of State for the Colonies, and on all matters affecting research its recommendations will be referred to the Colonial Research Committee for comment and advice before submission to him.

The committee is composed as follows: Mr. G. H. Creasy (Chairman), Colonial Office; Sir R. G. Archibald, Representative of the Sudan Government; Professor P. A. Buxton, London School of Hygiene and Tropical Medicine; Dr. H. Lyndhurst Duke, lately director of the Human Trypanosomiasis Institute in Uganda and Chairman of the League of Nations Sleeping Sickness Committee; Mr. S. A. Goulborn, Dominions Office: Professor I. M. Heilbron, Imperial College of Science; Dr. E. M. Lourie, Liverpool School of Tropical Medicine; Sir Guy Marshall; Dr. S. A. Neave, Director of the Imperial Institute of Entomology; Mr. G. F. Seel, Colonial Office; Dr. A. G. H. Smart, Medical Adviser to the Secretary of State for the Colonies; Mr. John Smith, M.R.C.V.S., Adviser on Animal Health to the Secretary of State for the Colonies; Dr. H. A. Tempany, Agricultural Adviser to the Secretary of State for the Colonies; and Mr. C. W. F. Footman (Secretary), Colonial Office.

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VETERINARY LEGISLATION IN EIRE

As a result of the Post-War Agricultural Committee report on veterinary research and animal diseases, further legislation would be necessary, said Dr. Ryan, Minister for Agriculture, speaking in the Dail on the Diseases of Animals Bill, the second stage of which was agreed.

Introducing the Second Reading, the Minister said the Bill aimed at the amending of existing Acts which dated from 1894. Henceforth all diseases of animals would be deal with under one Bill and would give greater power to Central Government. The matter of compensation was also being dealt with. Under existing law compensation could only be paid where the animals suffering from foot-and-mouth disease were slaughtered, but often animals died before slaughter could take place and that was a matter which was being dealt with now.

Later on he hoped to introduce a Bill bringing the whole legislation up to date.

Mr. Cogan said it was very gratifying that the Minister had plans for a better veterinary service.

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FOOT-AND-MOUTH DISEASE

On Thursday of last week the existence of foot-and-mouth disease was confirmed among pigs at Yorkley, Lydney, Gloucestershire. At a later date the disease was confirmed among pigs at Laughton Common, Dinnington, Sheffield, Yorks, W.R., Chesterfield, Derbyshire, and Marston Jabbett, Nuneaton, Warwickshire.

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NORFOLK C.C.'s TUBERCULIN-TESTED HERD

"In purchasing a pedigree, tuberculin-tested dairy herd, to supply the mental deficiency colony at Little Plumstead, Norfolk C.C., as the public health authority for the county, is setting an example in the production of pure milk," states the *Municipal Journal*, and continues: "At a Council meeting the action of the Committee responsible for administering the colony in expending approximately £1,397 on the purchase of the livestock and £525 on alterations to the farm buildings, provision of new equipment, and so on was approved.

"The question of the disposal of the reactor cows in the old herd was considered. These animals could have been sold in the open market, but, in the interests of health generally, and in spite of the financial loss involved (since reactors formed the majority of the herd), it was decided to slaughter all the reactor cows on the premises of the colony and to sell the carcases. The few non-reactors and one doubtful reactor were, it was decided, to be sold in the ordinary way for slaughter or, together with the bull, in the open market."

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"BRAND T.T. REACTORS"

Cornwall Diseases of Animals Committee reported to the county agricultural committee that the indiscriminate disposal of reactors to the tuberculin test stock defeated the drive for clean herds, and put forward a resolution asking that the present state of affairs be remedied. The resolution is to go to the Ministry of Agriculture. The Chairman said the idea was that animals should be branded to show they were reactors. Members pointed out that under present arrangements they were powerless to stop animals from diseased areas being sent to those which were free.

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NOBEL PRIZE AWARDS FOR MEDICINE

The first Nobel Prizes since 1939 were awarded on October 26th, when the Royal Carolean Institute of Medicine in Stockholm announced the winners of the 1943 and 1944 prizes for physiology and medicine.

This year's prize is shared by Professor Emeritus Joseph Erlanger, of Washington University, St. Louis, and Professor Herbert Spencer Gasser, head of the Rockefeller Institute of Medical Research

in New York, for their studies of nerve reactions. The 1943 award is shared by Professor Henrik Dam, of Copenhagen, who has been in the United States since 1940, and Professor Edward A. Doisy, professor of biochemistry at St. Louis University, St. Louis, for the discovery of and research into Vitamin K.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal views of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

Letters to the Editor should reach the Office not later than by the first post on Monday morning for insertion in following Saturday's issue.

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ABORTION VACCINES

Sir,—On the subject of contagious abortion vaccines I and II, I should like, most heartily, to endorse what Mr. Roach has written in to-day's *Veterinary Record*.

What he does not mention is that the elaborate experiment conducted by Dr. McEwen is still being continued in a limited number of herds, and probably the publication of the results will appear in good time. I, like Mr. Roach, look forward to that.

My own experience of vaccine II, used according to Dr. McEwen's recommendations, is that it is not only "nearly" (quoting Mr. Roach) but actually 100 per cent. efficient. I have not yet found a vaccinated non-reacting cow develop agglutinins, even though the degree of infection in the herd be high.

There is a point I should be glad to have explained to me. Why has there been so much publicity given to strain 19, whereas McEwen's vaccine barely receives official mention?

Yours faithfully,

High Street, Helmsley, Yorkshire. E. W. F. MacLeish.

October 21st, 1944.

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"THE INTRADERMAL TEST IN BOVINE TRICHOMONIASIS"

Sir,—In reply to Mr. Farrelly's letter, I should like first of all to point out that the work discussed in the paper to which he refers is still in an early stage of development and is the subject of active research at the present time.

Allergy, anaphylaxis and the presence of immune body are related phenomena, but unfortunately the word allergy is applied so loosely and to cover so many different manifestations that its use is often a source of great confusion.

Suppose these words are, for the moment, discarded and the facts considered.

The skin reaction in the *Trichomonas* extract test has been shown experimentally in the artificial vaccination of animals and in certain field cases to be preceded by circulating antibody in the blood of the animal. This apparently becomes fixed in the skin and possibly in other tissues of the body, and it is the reaction of the *antigen* (*i.e.*, the *Trichomonas* extract) with the cell fixed *antibody* that seems to produce the skin manifestation.

It is true that this has close analogies with what occurs in anaphylaxis, but it seems unwise to call this minor reaction by that name.

In most skin sensitiveness produced by infection it is open to question whether there is not some degree of circulating antibody before the development of the skin reaction, *i.e.*, the fixation of the antibody. The difficulty of measuring the humoral reaction in certain cases is extremely well illustrated in tubercle and in many other diseases. The means of detecting antibody except in the case of certain toxin-producing infections are very rough and inadequate.

In the case we are considering, the calf at birth before any food has been taken is, so far as the writer's experience goes, always skin negative and no agglutinins can be found in the blood.

The calf of a normal mother does not develop skin sensitiveness upon being fed on its mother's normal colostrum. It is a direct and often repeated observation that the infant calf on ingesting (during the first 24 hours of life) the colostrum of a cow with a high blood titre—a titre which is also found in the whey from the colostrum—develops a blood titre against *Trichomonas* of about the same degree as that of the colostrum. This gradually disappears. The calf at some period which varies a little shows the skin reaction due, just as in the adult animal, to the fixation of the antibody in the cells of the skin.

That this passive transference is not quite identical with that produced by the injection of serum is probable.

I should like to point out that the duration of the presence of fixed antibody in the skin of the calf is not immediately connected with the excretion of the serum. It is also simply not known whether the globulin taken in by the calf with the colostrum is excreted according to the same rules as that of other passively injected blood proteins.

It is possible that if Mr. Farrelly could produce a living calf infected *in utero* with *Trichomonas foetus* it might have a positive skin reaction against *Trichomonas* extract.

In conclusion, if Mr. Farrelly will wait till the research is carried further and more of the work is published, he will have a better basis for his criticism.

The matter is an intricate one and cannot be fully dealt with in a letter.

Yours faithfully,

Stormont, Belfast. W. R. Kerr.

October 19th, 1944.

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"SOME CLINICAL DIAGNOSTIC METHODS OF USE IN CONDITIONS ASSOCIATED WITH ANIMAL PARASITES"

Sir,—The facetious opening sentence of the letter from Dr. Oldham and Miss Bingham published in *The Veterinary Record* of October 14th is quite pointless, since no suggestion was made that liver and lights are not eaten by carnivora. I must plead guilty to overlooking the cat as an animal that may eat its entire victim, and also the reference to the occurrence of coccidia in equines.

In the paragraph at the top of page 394 an attempt is made to distort my comment, which was that coccidiosis cannot be diagnosed by recognising the damage caused by the parasites to the epithelium cells. The existence of damage was, of course, not denied.

It is perhaps strange that in a paper dealing with clinical methods of diagnosis the examination of sections of the bowel should be referred to. Miss Bingham holds the view that oöcysts are shed in "regular cycles" and that as a result no coccidia may be found in a particular sample of faeces. It is quite inconceivable that no oöcysts are present at all in the intestinal contents of an animal affected with coccidiosis and I would suggest that since the animal's intestine is available for sectioning then the entire intestinal contents are available for examination, and it would be more profitable to examine these than to go to the trouble of cutting sections, as every square inch of bowel wall furnishes material for some thousands of sections.

If it were not that the "shedding of oöcysts in regular cycles" does not occur, one might be tempted to ask what is the periodicity of the cycles?

I am not at variance in the least with Dr. Wenyon regarding the life cycle of coccidia; my point is that the development of the fertilised oöcyst proceeds to sporozoite formation without any artificial cultivation. Dr. Oldham and Miss Bingham are at pains to point out that the dictionary defines a "'culture' of bacteria as an 'artificial development' without mentioning multiplication." I should be interested to learn how a bacterial culture is obtained if multiplication is excluded.

If Dr. Oldham and Miss Bingham will read my paper on the flotation technique, they will perhaps find that their statement that any inert liquid will serve is too sweeping.

Yours faithfully,

Wroxton, Chorleywood, Herts. A. Leslie Sheather.

October 26th, 1944.

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THE DEMOBILISED VETERINARY SURGEON

Sir,—The future of the veterinary profession lies not only in the hands of the graduates of the future but more immediately and to a greater extent in the skill and ability of its present-day members. It is the standard of the individual's work which is the making or the undoing of the profession as a whole. For that reason I wish to bring up a matter which I feel has escaped the notice of many.

I am one of a great many graduates of the last few years who, having had very little, if any, experience in private practice after graduation, are now in one or other branches of His Majesty's Forces. I feel it is almost unnecessary to say that we are slowly but surely forgetting much of vital importance to our efficiency as veterinary surgeons in private practice.

I should not speak for those in the Royal Army Veterinary Corps, but I strongly believe their position in this matter is very similar to that of members serving in a non-veterinary capacity. However, I hope that they themselves will voice their side of it in your columns.

There are many of us who have been away from veterinary work completely for anything up to five years, and obviously would be very poor practitioners at the present moment if one had the

effrontery and courage to go straight back into practice on demobilisation—BUT we still have the letters M.R.C.V.S. after our names, and that to the public is a symbol of ability.

Not only is it grossly unfair to the public to have practitioners coming back into the profession unable to do their job competently, but also it is going to reflect very seriously on the reputation of the profession as a whole. So surely some step must be taken to ensure that those holding the diploma of membership are competent to practise veterinary surgery.

There are, I feel, one or two answers to this problem, but not wholly satisfactory ones.

The first and obvious one is a refresher course, but I can foresee the following snags:—

(*a*) Will serving members, particularly those who are married, be able to afford to spend three months (which I consider would be a necessary minimum) studying whilst earning nothing?

(*b*) The demobilisation will probably be such that members will be slowly filtered out over a period of two or three years, or more, with the result that the classes for refresher courses would be very small and it would be necessary continually to repeat the course over a period of years. With small classes could one expect to have lecturers engaged solely for the course, and if not, then could one expect the present lecturers at one or other of the colleges to be able to devote a sufficiency of their time to the course?

(*c*) If special classes were not held and one was simply to attend certain fourth and final year lectures and demonstrations, then much time would be spent covering more detail than necessary for a refresher, and a lot of important information would not be obtained in the time allotted.

The second suggestion I make is that one should go as a paid student to an experienced practitioner, or what it would boil down to would be, as an assistant at a reduced salary, until one is considered by one's employer to be a competent veterinary surgeon, capable of earning a normal salary. To this also I see the following snags:—

(*a*) Lowering salaries for qualified men should be avoided at all costs. It could so easily be abused and end up by being most harmful to the new graduate.

(*b*) It is not an ideal way of restoring forgotten knowledge, as one would only see the work particular to one practice, and hear the views of, and see cases handled by, one man only. In other words, one's field of instruction would be limited.

(*c*) One might be unfortunate in the choice of employer and find oneself doing mainly routine and uninstructive work, *i.e.*, being used as cheap help with no compensating instruction in general practice.

A third suggestion I would like to make is in the form of a question: Would it be possible to get a Government grant to enable qualified men to do a refresher course? I believe it is the Government's intention to help students, who have broken off their studies, to continue them after the war; could not qualified men be included in that category? Some may say that the anticipated post-war gratuity will be intended to cover that. I disagree most strongly; it will be needed to enable one to set up a home and buy the many necessities for restarting a civilian life.

I have puzzled over this matter very deeply: How best can we serving members return to veterinary work and attain maximum efficiency at a minimum of time and expenditure?

I would be deeply interested to hear the views of your readers.

Yours faithfully,

R. L. WOOLDRIDGE,
Flight Lieutenant, R.A.F.V.R.

October 2nd, 1944.

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THE FUTURE OF THE R.C.V.S.

Sir,—I have read Dr. Innes's letter with interest. We must remember that the Royal College of Surgeons and the Royal College of Physicians survive for two reasons. All the medical schools teach not only for university degrees, but also for the M.R.C.S., L.R.C.P., which is supposed to be a lower qualification than M.B., B.S. or M.B., Ch.B. of the universities (no doubt the true verdict is that given by the patient who assesses the healer on his skill, irrespective of whether he holds a diploma or degree!).

Medical students, like the rest of humanity, tend to take the easy road—the line of least resistance—and so, in London for example, they take the so-called conjoint examinations first. If they pass, they are entitled to registration and are medical practitioners. Many of them then drop their studies for the Final *Degree* Examination and thus the University complains that it loses many medical graduates. The other reason for their survival is that they are *old-established* institutions with splendid buildings, magnificent libraries, and so far as the R.C.S. is concerned, a really wonderful museum. They possess *many endowments*, they have periodical lectures, they award medals, and of course the Fellowship of both the R.C.S. and the R.C.P. is recognised all the world over as better than any medical *degree*.

Dr. Innes suggests that the R.C.V.S. might go and do likewise, and spend its energies in other ways than in examinations. It might build a beautiful Central Veterinary Library, possibly also a Central Veterinary Museum, and above all, concentrate on making the Fellowship a really high standard diploma that will be coveted, not only by members, but also by university graduates.

The findings and recommendations of the Goodenough Committee on Medical Schools have been universally applauded, and an analogy has been drawn in some of these, with those of the Second Report of the Loveday Committee on Veterinary Education. One must not overlook the basic fact that it is a rather scathing indictment of the existing system in medical education, with a multi-portal system of entry (no less than 23 licensing bodies grant a degree or diploma).

I am of the opinion that of all the suggested solutions for a common agreement over the Second Report of the Loveday Committee, that propounded by Major Leslie Pugh, F.R.C.V.S., and presented by him to the Council of the R.C.V.S. at its meeting on October 17th, is the best.

I am in entire agreement with him that, provided the following points are accepted, the chances of arriving at a satisfactory settlement are enhanced:—

(1) Affirm agreement that the future of veterinary education lies within universities.

(2) It is essential thaf veterinary schools within universities be given full faculty or college status (*not* part of another faculty).

(3) Welcome the opportunity to exercise a unifying influence over the schools.

(4) Press that external examiners in clinical subjects *must* be appointed from a panel maintained from the R.C.V.S. in the ratio of two external to one internal.

(5) Resist the Loveday Committee's proposed reconstitution of Council, but accept two nominees by the Crown and one teacher from each school.

I commend these to the most serious consideration by both schools of thought in the profession.

In conclusion, I do most strongly urge the profession to decline any proposal to employ unqualified assistants, and I advise the Association of Veterinary Students to be on its toes to defeat such an innovation, which cannot do otherwise than act deleteriously to the interests of the qualified.

Any unqualified assistant employed must not aspire beyond what is generally regarded as a "handyman."

Yours faithfully,

"Rothiemurchus," J. F. D. TUTT.
St. Cross, Winchester.
October 21st, 1944.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Parasitic Mange*	Sheep Scab	Swine Fever
Sept. 1st to 15th, 1944...	5	11	—	3	129
Corresponding period in—					
1943 ...	11	—	—	2	19
1942 ...	16	57	—	1	21
1941 ...	11	—	—	1	29
Total Jan. 1st to Sept. 15, 1944	138	83	7	80	994
Corresponding period in—					
1943 ...	218	15	6	115	401
1942 ...	252	502	26	131	350
1941 ...	331	258	15	151	967

NOTE.—The figures for the current year are approximate only.
* Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at September 30th, 1944, was as follows:

ENGLAND	WALES	SCOTLAND	TOTAL (GREAT BRITAIN)
4,228	8,541	3,872	16,641